

**From:** James Peale  
**To:** [Jen Mott](#); [BAYUK Dana](#)  
**Cc:** [Mike Gefell](#); [Halah Voges](#); [John Edwards](#); [Ben Hung](#); [Sheldrake, Sean](#); [DeMaria, Eva](#); [Lance Peterson \(PetersonLE@cdmsmith.com\)](#); [Scott Coffey](#); [Bruce K Marvin \(bmarvin@geosyntec.com\)](#); [Cindy Bartlett \(CBartlett@Geosyntec.com\)](#); [Dan Hafley](#); [Henning Larsen](#); [peterson.Jennifer@deq.state.or.us](#); [poulsen.mike@deq.state.or.us](#); [Vipul Srivastava \(VSrivastava@Geosyntec.com\)](#); [Kelly Titkemeier](#); [Mary Benzinger](#); [Mike Murray](#); [Myron Burr \(myron.burr@siltronic.com\)](#); [Bob Wyatt](#); [Patty Dost](#); [Rachel Melissa \(RMelissa@pearllegalgroup.com\)](#); [Sarah Riddle](#); [Carl Stivers](#); [Matt Wilson](#); [Todd Thornburg](#); [John Renda](#); [Ben Johnson](#); [Rob Ede](#)  
**Subject:** RE: NW Natural: Siltronic June 19, 2017 Comments on 2016 DNAPL Monitoring Summary Report  
**Date:** Tuesday, October 10, 2017 3:59:59 PM  
**Attachments:** [image001.png](#)  
[2009\\_03\\_18\\_Anchor\\_Gasco DNAPL Mobile Memo.pdf](#)  
[Tf-DNAPL Accumulation Rates.pdf](#)

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Dana –

The following is provided by MFA on behalf of Siltronic in response to the September 18, 2017 email from Jenn Mott of Anchor QEA, LLC (AQ) on behalf of NW Natural.

### **Calculation is not in error**

MFA stands by the calculation that demonstrates that accumulation of 50 gallons per year correlates to an accumulation of 0.84 feet/day in a 2-inch diameter well. A careful review of MFA's comment letter confirms that MFA did not assert that PW-2L is a 2-inch diameter monitoring well. The calculation was provided in order to allow for comparison to PG&C DNAPL accumulations in 2-inch diameter monitoring well data presented in Table 3 (from AQ's DNAPL summary Report), and as collected elsewhere on the Gasco and Siltronic properties (see attached tables, and paragraph 2 of page 2 of the MFA comment letter). (Please note that the analysis in the attached tables relies on a representative subset of the PG&C DNAPL thickness data (from Siltronic wells) supplied to DEQ and NWN as an accompaniment to the monthly progress reports.)

It is not inappropriate to conclude that accumulations at or in excess of 50 GPY (or on the order of 0.84 ft/day in a 2-inch monitoring well) represents movement of PG&C DNAPL through the subsurface at relatively high rates. The attached tables provide calculated accumulation rates from selected monitoring events (i.e., removal of PG&C DNAPL as required to complete sampling) and during the PG&C DNAPL Removal event in 2012. As noted on the attached tables, MFA calculated average accumulation rates in 2-inch diameter wells (screened in both the Fill WBZ and the alluvium) of 0.317 to 0.637 ft/day. The example of 0.84 ft/day falls within the range of values shown on the tables.

### **PW-2L accumulation rates are not anomalous**

The accumulation rates at PW-2L do not appear to be anomalous, based on data provided by AQ and as described in the attached tables. NWN monitoring wells MW-6-32 and MW-13-30 accumulate at a combined and increasing rate of 255 GPY, which is greater than 50 GPY. These wells are 2-inch diameter wells. Absent a comprehensive evaluation of PG&C DNAPL accumulation rates based on data from all of the wells on the Gasco and Siltronic properties, the assertion that observations from PW-2L are anomalous is unsubstantiated.

MFA notes that viscosity is not the only, nor is it the most important variable determining PG&C DNAPL flow in the subsurface. MFA reviewed the March 18, 2009 Memorandum provided by AQ regarding the Evaluation of Potential DNAPL Mobilization in Former Effluent Pond Area by Shoreline Source Control Extraction Wells, Gasco Site (copy attached). The memorandum was prepared in response to concerns (raised by DEQ and Siltronic) that HC/C operations could mobilize PG&C DNAPL and increase the nature and extent of PG&C DNAPL-related impacts. The memorandum identified multiple other variables that control or influence PG&C DNAPL flow in the subsurface. The memorandum also developed two equations (numbered (4) and (5) in the memorandum) in order to evaluate potential mobilization of a PG&C DNAPL pool, or mobilization of residual DNAPL, as a result of pumping. Neither equation (4) nor equation (5) includes viscosity as a variable.

### **Concerns persist regarding HC/C gradients and PG&C DNAPL mobilization**

The conclusions from the 2009 memorandum were that PG&C DNAPL mobilization would not be enhanced by groundwater extraction, because the gradients induced by the extraction wells would not be great enough. MFA is concerned that “extreme hydraulic gradients” referenced by Mr. Gefell were established by intermittent pumping of this well. We also suggest that the predictions and conclusions regarding PG&C DNAPL mobility presented in the 2009 memorandum be revisited in the context of this new information. Furthermore, review of the recently distributed HC/C system operation figures (for the time period of January – June 2017) do not show these “extreme hydraulic gradients” in the potentiometric contour maps of the Lower Alluvium. MFA is surprised to learn that PW-2L produces the cited extraction rates. The February 17, 2017 Gasco Groundwater Modeling Report by AQ stated that PW-1L actually has the highest extraction rate (approximately 60 gpm). It’s not clear how the high extraction rates in PW-2L cited by AQ are consistent with the model calibration or validation efforts.

The HC/C system has been operational (i.e., no longer in testing or evaluation) since the beginning of 2017. The long-term reliability of the HC/C system has not been demonstrated, and data or analysis determining that PW-2L is anomalous, as opposed to representative of current or future conditions, has not been provided. In other words, NWN has not provided data or analysis to support the broad assertion that PG&C DNAPL accumulation rates in PW-2L cannot reasonably be expected to occur at other locations in the future.

MFA acknowledges that PG&C DNAPL accumulation rates in shoreline and other upland wells are heterogeneous, and may be independent of any individual variable. In other words, the data do not appear to provide a conclusive understanding of the mobility of PG&C DNAPL. On behalf of Siltronic, MFA is concerned that the mobility of PG&C DNAPL, within or beyond the influence of the HC/C system, remains unresolved.

MFA concludes the following:

- o MFA and DEQ raised concerns about mobilization of PG&C DNAPL by the HC/C system, prompting the analysis provided in the 2009 AQ memo. The predictions and conclusions in the 2009 memo appear to be contradicted by the assertions in AQ’s September 18, 2017 email.
- o MFA reviewed the AQ 2017 DNAPL Summary memo and noted that accumulation rates in both

monitoring and extraction wells were significant, and indicated that PG&C DNAPL is moving through the subsurface at relatively high rates. The objective of providing this observation was to reiterate a concern regarding mobilization of PG&C DNAPL due to groundwater extraction as a source control measure.

o Per the 2017 Groundwater Model Report prepared by AQ, minimizing the mobilization of PG&C DNAPL is an objective for the HC/C system. The information in AQ's September 18, 2017 email raises the concern regarding mobilization again. Taken in context with the 2009 AQ memorandum and the attached data, it appears that PG&C DNAPL mobilization due to HC/C operation is poorly understood.

Please don't hesitate to call or email if you have any questions regarding this information.

jp

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**From:** Jen Mott [mailto:jmott@anchoragea.com]

**Sent:** Monday, September 18, 2017 3:27 PM

**To:** BAYUK Dana <dana.bayuk@state.or.us>

**Cc:** Jen Mott <jmott@anchoragea.com>; Mike Gefell <mgefell@anchoragea.com>; Halah Voges <hvoges@anchoragea.com>; John Edwards <jedwards@anchoragea.com>; Ben Hung <bhung@anchoragea.com>; Sean Sheldrake <sheldrake.sean@epa.gov>; Eva DeMaria (DeMaria.Eva@epa.gov) <DeMaria.Eva@epa.gov>; Lance Peterson (PetersonLE@cdmsmith.com) <PetersonLE@cdmsmith.com>; Scott Coffey (coffeyse@cdmsmith.com) <coffeyse@cdmsmith.com>; Bruce K Marvin (bmarvin@geosyntec.com) <bmarvin@geosyntec.com>; Cindy Bartlett (CBartlett@Geosyntec.com) <CBartlett@Geosyntec.com>; Dan Hafley <HAFLEY.Dan@deq.state.or.us>; Henning Larsen <larsen.henning@deq.state.or.us>; Jennifer Peterson (peterson.jennifer@deq.state.or.us) <peterson.jennifer@deq.state.or.us>; Mike Poulsen (poulsen.mike@deq.state.or.us) <poulsen.mike@deq.state.or.us>; Vipul Srivastava (VSrivastava@Geosyntec.com) <VSrivastava@Geosyntec.com>; James Peale <jpeale@maulfooster.com>; Kelly Titkemeier <ktitkemeier@maulfooster.com>; Mary Benzinger <mbenzinger@maulfooster.com>; Mike Murray <mmurray@maulfooster.com>; Myron Burr (myron.burr@siltronic.com) <myron.burr@siltronic.com>; Bob Wyatt <rjw@nwnatural.com>; Patty Dost <pdost@pearllegalgroup.com>; Rachel Melissa (RMelissa@pearllegalgroup.com) <RMelissa@pearllegalgroup.com>; Sarah Riddle <sriddle@pearllegalgroup.com>; Carl Stivers <cstivers@anchoragea.com>; Matt Wilson <mwilson@anchoragea.com>; Todd Thornburg <tthornburg@anchoragea.com>; John Renda <jrenda@anchoragea.com>; Ben Johnson

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**Subject:** NW Natural: Siltronic June 19, 2017 Comments on 2016 DNAPL Monitoring Summary Report

Dana,

[The following email is provided on behalf of Mike Gefell.](#)

Dana: NW Natural wanted to make you aware of a significant technical error in Siltronic's comments on the 2016 DNAPL Monitoring Summary Report for Gasco (attached). Specifically, Siltronic states on Page 3, Section 2.2, 2<sup>nd</sup> paragraph that DNAPL accumulation rates of up to 50 gallons per year (GPY) have been measured in nearshore wells, and that this correlates to approximately 0.84 feet per day of accumulation in a 2-inch monitoring well. Siltronic concludes that this "indicates DNAPL is moving through the subsurface at relatively high rates." Siltronic's analysis is incorrect, and its conclusion is technically unsupportable. The 50 GPY accumulation rate they cited was measured at well PW-2L, which is a 6-inch diameter HC&C extraction well, not a 2-inch monitoring well. The 50 GPY total accumulation in a 6-inch well represents an average 0.09 feet of accumulation per day, not 0.84 ft/day – a full order of magnitude error in calculation. Moreover, Siltronic singled out the well with highest DNAPL accumulation rate of all 19 shoreline-area wells that have historically contained DNAPL. Siltronic's conclusion about DNAPL movement through the subsurface at the site - based on data from one anomalous well location – is not technically defensible. The DNAPL at extraction well PW-2L has the lowest measured viscosity (and therefore the highest potential to flow) of all 13 DNAPL samples that have been collected at shoreline wells and physically characterized. Also, because well PW-2L is an HC&C extraction well, DNAPL entry rates into this well are greatly enhanced by extreme hydraulic gradients adjacent to the well induced by intermittent groundwater pumping. This well has produced groundwater extraction rates up to 100 gpm, and continuous average rates between 10 and 15 gpm for days or weeks. Because of the large size of the well, the anomalously low viscosity of the DNAPL at this particular location, and the hydraulic influence of active groundwater extraction at this well, the DNAPL entry rate at well PW-2L cannot be extrapolated to reach any broad conclusions regarding DNAPL movement rates in the subsurface across the site.

The data presented in the 2016 DNAPL Monitoring Summary Report demonstrate that DNAPL accumulation rates at the other shoreline wells are very low, and that conditions in the immediate vicinity of well PW-2L are an anomaly. In fact, contrary to Siltronic's erroneous comment above, the available data show that even immediately adjacent to the HC&C system DNAPL migration is minimal, and is either steady or decreasing in general. During the monitoring period covered in the report (2015-2016), the average DNAPL accumulation rate at the other 18 shoreline wells that have historically contained DNAPL is 4.9 GPY, an order of magnitude lower than the rate at PW-2L. Thirteen of those 18 wells have DNAPL accumulation rates of 4.5 GPY or less, and 8 of the 18 have DNAPL accumulation rates of 0.9 GPY or less. Fourteen of the 19 shoreline-area wells that have historically contained DNAPL have stable or declining DNAPL accumulation rates.

Please let us know if you have any questions or if you would like any additional information.

[Please contact Mike Gefell with any questions.](#)

Thank you,  
Jen Mott ☺  
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